

Functionalized Graphene Sheets-Polymer Based Nanocomposite for Cryotanks, Phase II

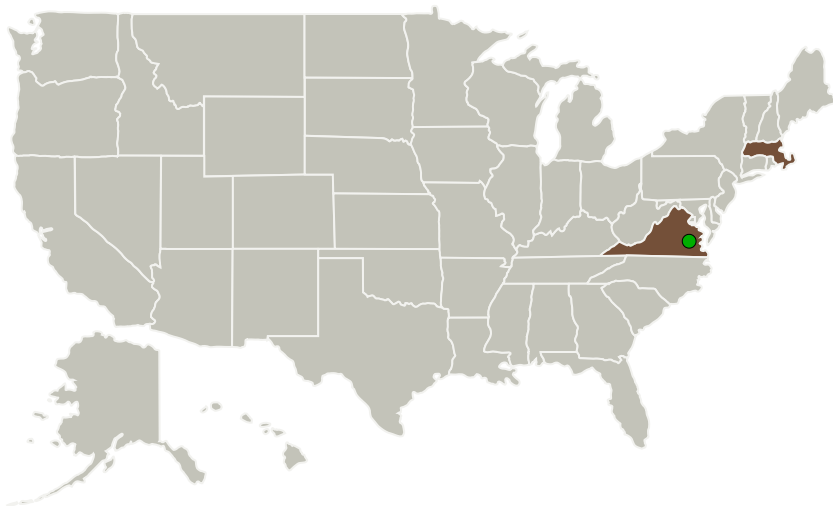
Completed Technology Project (2011 - 2013)



Project Introduction

In order to meet NASA's vision to develop sustainable and affordable solar system exploration strategies, NASA seeks advanced high-strength and high-toughness composite materials with the microcrack resistance at cryogenic temperatures. These materials must be suitable for use in fuel containment of liquid oxygen, hydrogen, and methane. The objective of this SBIR project is to develop advanced high microcrack-resistant composite cryotanks. In Phase I we successfully demonstrated the synthesis of functionalized graphene sheet (FGS) nanofillers in large scale, which exhibited significantly increased resin strength and toughness at both room and low temperatures, and reduced coefficient of thermal expansion (CTE). The further investigation of nanocomposite formulation and composite processing can result in FGS-polymer nanocomposite based carbon fiber reinforced polymer (CFRP) composites with significantly enhanced microcrack resistance at cryogenic temperatures in ways it has never done before. The new nanocomposite based CFRP composite materials also provide additional advantages in forming an impermeable barrier to gas and liquid molecules ideal for fuel tanks. Nanotrons' proposed new multifunctional nanocomposite based CFRP composite cryotanks will replace the currently used aluminum-lithium cryotanks providing significant weight savings and can be economically manufactured.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nanotrons Technologies	Lead Organization	Industry	Woburn, Massachusetts
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Massachusetts	Virginia

Project Transitions

June 2011: Project Start

June 2013: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138884>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Nanotrons Technologies

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

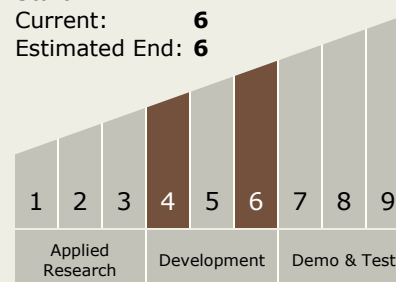
Carlos Torrez

Principal Investigator:

Je Kyun Lee

Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.1 Materials
 - └ TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System